EAST Browser - L23: (6) "5537491" an... | US 5537491 A | Tag: S,T1 | Doc: 6/6 | Format : KWIC

File Edit View Tools Window Help

Brief Summary Text - BSTX (3):

Mahoney, U.S. Pat. No. 5,239,596, describes techniques for labeling pixels in an image based on near neighbor attributes. FIG. 7 shows general steps in labeling pixels according to a link relationship criterion and FIG. 8 shows general steps in iterative labeling by applying a near neighbor criterion that is independent of distance. FIGS. 14-19, discussed beginning at col. 13 line 42, show steps in labeling pixels in various ways. A discussion of linked group labeling through grouping operations begins at col. 15 line 63. Grouping operations can apply a wide variety of criteria, including proximity. As discussed at col. 17 lines 15-19, a nearest neighbor criterion selects, at each pixel, the link for which the distance to the neighbor is the minimum. As discussed at col. 17 lines 26-43, a mutuality criterion selects, at each pixel, the link that is mutual with another link, which occurs when pixels are mutual neighbors. As discussed at col. 17 line 45-col. 18 line 11, a proximity grouping criterion defines clusters of elements using local neighbor distances alone, based on the intuition that cluster boundaries are locations of abrupt change in the distance between neighbors--that is, link-lengths vary slowly within a cluster but change abruptly at the boundaries between clusters. As described at col. 18 lines 6-12, sensitivity to scale may be controlled by deselecting a link if it is longer than the product of a constant parameter times the larger of two distances, one of which is the shortest link at the same pixel, the other of which is a global distance parameter. The global distance parameter could, for example, be based on the length of the longest link in the image or the most common link length. Source code for proximity grouping begins in cols. 31 and 32, near mid-page.

Brief Summary Text - BSTX (14):

A two-dimensional array can indicate a value for each pixel of an image or for each item in another body of data. In an array defining an image, for example, the technique can compare the threshold with each pixel's distance to

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EAST Browser - L23: (6) "5537491" an... | US 5537491 A | Tag: S,T1 | Doc: 6/6 | Format : KWIC

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Brief Summary Text - BSTX (14):
A two-dimensional array can indicate a value for each pixel of an image or for each item in another body of data. In an array defining an image, for example, the technique can compare the threshold with each pixel's distance to a near neighbor that meets a reference criterion, such as ON or OFF. In clustering, the technique can set a pixel ON if its distance is below the threshold. In segmentation, the technique can set a pixel ON if its distance is above the threshold.

Brief Summary Text - BSTX (18):
To group parts of an image, as in clustering or segmentation, the technique can obtain the gap data from data defining the image. For example, the gap data can indicate, for each pixel, a distance to a black pixel that is a near neighbor of the pixel. The threshold can be compared with each pixel's distance to obtain a thresholded version of the image; each pixel with a distance above the threshold can be ON, or, alternatively, each pixel with a distance below the threshold can be ON. The technique can obtain the grouping data by labeling each pixel in a part of the image with a unique identifier of the group in the thresholded version that includes the part.

Brief Summary Text - BSTX (23):
The third approach can be applied in many ways. For initial array data defining an image, in which each item is a pixel value, clustering and segmentation can be performed as follows:

Brief Summary Text - BSTX (24):
To cluster the gap data can indicate distance to a near neighbor for each

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EAST Browser - L92: (1) "5537491" an... | US 5537491 A | Tag: S,T1 | Doc: 1/1 | Format : KWIC

File Edit View Tools Window Help

Brief Summary Text - BSTX (24):

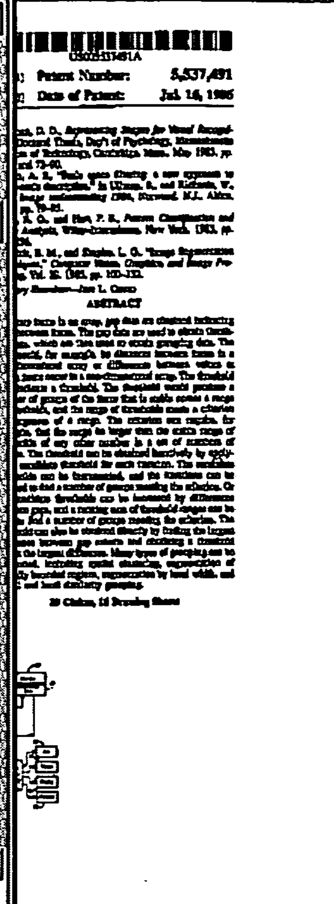
To cluster, the gap data can indicate distance to a near neighbor for each pixel that meets a foreground neighbor border criterion, meaning that it is at a border between pixels that have different near neighbors. The threshold can be compared at each pixel with the pixel's distance to a near neighbor in the image to obtain a grouped version of the image. Pixels with distances below the threshold are grouped together into connected regions or components in the grouped version of the image.

Brief Summary Text - BSTX (25):

To segment partially bounded regions, the gap data can indicate distance to a near neighbor for each pixel that meets an opposing foreground neighbor border criterion, meaning that it is at a border between pixels that have near neighbors approximately 180.degree. apart in direction. The threshold can be compared at each pixel with the pixel's distance to a near neighbor in the image. Pixels with distances above the threshold are grouped together into connected components.

Brief Summary Text - BSTX (26):

To segment by local width, the gap data can indicate distance to a near neighbor for each pixel that meets an opposing background neighbor border criterion, meaning that it is at a border between pixels that have near neighbors in the complement of the image that are approximately 180.degree. apart in direction. The threshold can be compared at each pixel with the pixel's distance to a near neighbor in the complement of the image. Pixels with distances above the threshold are grouped together into connected components.



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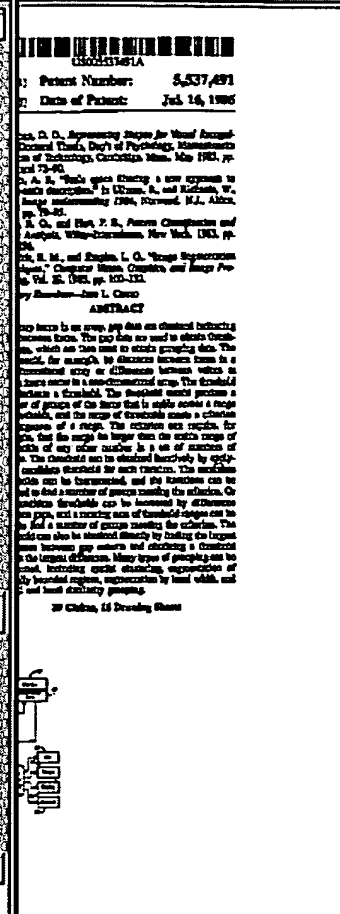
EAST Browser - L92: (1) "5537491" an... | US 5537491 A | Tag: S,T1 | Doc: 1/1 | Format : KWIC

File Edit View Tools Window Help

Detailed Description Text - DETX (181):
Segmentation of partially bounded regions as in FIG. 13 can obtain meaningful regions that are not defined by closed, connected bounding contours. Such regions are referred to as "partially bounded regions," and examples include regions defined by dotted or dashed boundaries and boundaries in which spaces may be quite wide. Partially bounded regions cannot be extracted based on connectivity of boundaries, but could in some cases be extracted by transforming disconnected boundary elements into a connected boundary. Proximity grouping, however, can extract partially bounded regions directly, without a connected boundary, by applying a threshold distance to distances at narrowings of the background region, which occur at spacings between foreground components. The narrowings can be distinguished based on background ridge points with near neighbor boundary points that are nearly diametrically opposed.

Detailed Description Text - DETX (182):
To perform segmentation of partially bounded regions as in FIG. 13, the gap data can be obtained by applying an opposing foreground neighbor border criterion that requires a pixel that is on a border between parts of the input image in which pixels have near neighbors in the foreground that are approximately 180.degree. apart. The criterion can be applied by using input image 410 to obtain a direction data image in which each pixel is labeled with a direction to a near neighbor, then using the direction data image to obtain a direction difference data image, and then comparing each pixel's value in the direction difference data image with a criterion angle, such as 140 degrees, to obtain a large angle data image in which each pixel is ON if its value in the direction difference data image is greater than the criterion angle.



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EAST Browser - L47: (4) "5764[illegible]9" an... | US 5930393 A | Tag: S | Doc [illegible]/4 | Format : KWIC

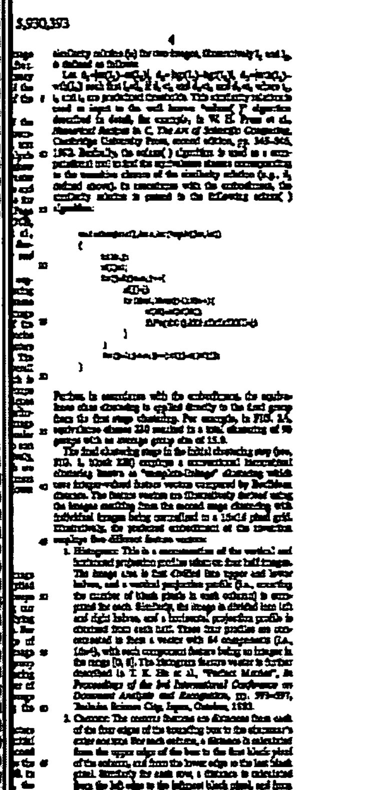
File Edit View Tools Window Help

Detailed Description Text - DETX (30):

It should be noted that in accordance with the embodiment, during the various stages of the initial clustering, once two images (i.e., characters or symbols) are separated into different clusters they will remain so separated in each subsequent clustering step. Further, after the third stage of the initial clustering, it is advantageous to identify particular single images which do not belong to any existing cluster and merge such images with an existing cluster. These non-matching single images are termed "singletons". Illustratively, the singleton merging operation uses a similarity relation similar to that as described previously with regard to the second stage of the initial clustering. However, in the merging of singletons the similarity relation is defined on size-normalized images such that two images are considered equivalent if their Hamming distance is less than a predetermined threshold value. As is well known, a Hamming distance is not a physical distance but is a specific measure of the difference between two binary numbers. Hamming distance is defined in the general case as the number of bit positions in which a pair of binary words differ. Hamming distances are further described, for example, in John Watkinson, Art of Digital Video, second edition, Focal Press, pp. 351-355, 1994. Referring back to numerical results 200 (see, FIG. 2A), if a threshold value of 15 is selected for the Hamming distance comparison, merging singleton results 270 shows a reduction in the number of groups to 287 with an average group size of 5.4.

Detailed Description Text - DETX (51):

Furthermore, another benefit of substantially reducing the total cluster count by merging singletons is that algorithms used to find equivalence classes, such as the eclazz() algorithm previously discussed, can be applied to further improve clustering in accordance with the invention. More particularly, smaller cluster counts facilitate the use of a quadratic



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EAST Browser - L46: (8) 44 and bella | US 6259827 B1 | Tag: S | Doc: 4/9 | Format : KWIC

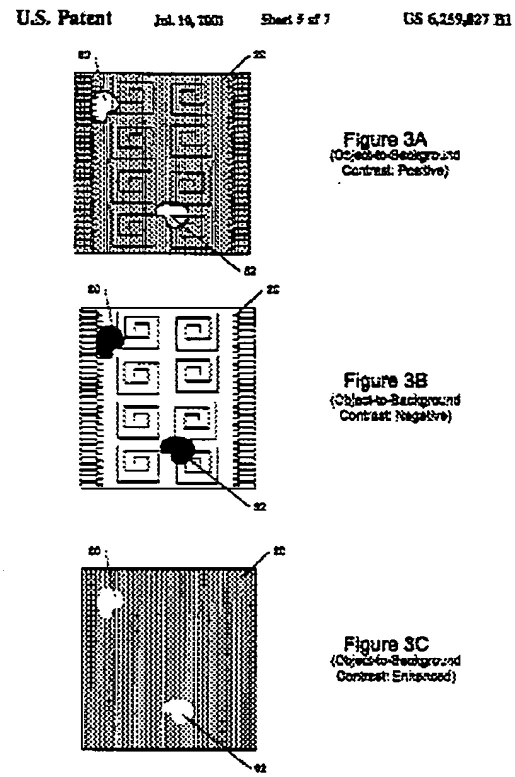
File Edit View Tools Window Help

Brief Summary Text - BSTX (9):

Though the segmentation techniques described above are useful in isolating features of simple objects, they are often of only limited value in identifying objects with complex backgrounds. This typically arises in defect detection, that is, in segmenting images to identify defects on visually complicated surfaces, such as the surface of a semiconductor die, a printed circuit board, and printed materials. In these instances, segmentation is used to isolate a defect (if any) on these complex surfaces. If the surface has no defects, segmentation should reveal no object and only background. Otherwise, it should reveal the defect in the image as clusters of 1's against a background 0's.

Current US Cross Reference Classification -

Details Text Image HTML KWIC



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EAST Browser - L46: (8) 44 and bella... | US 6259827 B1 | Tag: S | Doc: 4/8 | Format : KWIC

File Edit View Tools Window Help

Brief Summary Text - BSTX (9):

Though the segmentation techniques described above are useful in isolating features of simple objects, they are often of only limited value in identifying objects with complex backgrounds. This typically arises in defect detection, that is, in segmenting images to identify defects on visually complicated surfaces, such as the surface of a semiconductor die, a printed circuit board, and printed materials. In these instances, segmentation is used to isolate a defect (if any) on these complex surfaces. If the surface has no defects, segmentation should reveal no object and only background. Otherwise, it should reveal the defect in the image as <u>clusters</u> of 1's against a background 0's.

Current US Cross Reference Classification -

Details | Text | Image | HTML | KWIC

U.S. Patent Jul. 10, 2001 Sheet 6 of 7 US 6,259,827 B1

Figure 3D
(Background Only)

Figure 3E
(Object + Background)

Figure 3F
(Object-to-Background Contrast: High)

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Brief Summary Text - BSTX (11):

Each matrix is then subjected to certain operations for compression. In MJPEG, each image frame is compressed using the standard JPEG compression technique. In JPEG, the first step is to perform a "discrete cosine transform," or DCT. In effect, the DCT changes the image space for the matrix, so that a vector related to the average luminance of all of the pixels in the block is made into an axis of the space. Following the DCT, the coefficients in the original matrix still completely describe the original image data, but larger value coefficients tend to cluster at the top left corner of the matrix, in a low spatial frequency region. Simultaneously, the coefficient values toward the lower right hand portion of the matrix will tend toward zero for most blocks in an image frame in an image sequence.

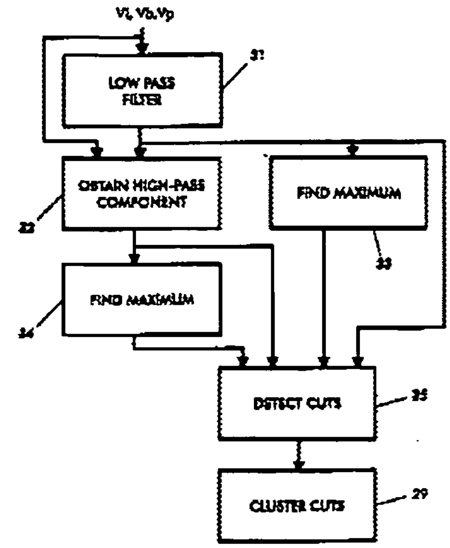

FIG. 11

File Edit View Tools Window Help

objects by clustering the estimated motion vectors. The boundaries of the objects found by these methods may be inadequate in some applications either due to utilization of block based motion estimates, or as a consequence of the the occlusions which are not taken care of. Usually, these motion vectors are estimated from the given image sequence but the resultant vectors may be erroneous. If segmentation is based on clustering of these possibly erroneous motion vectors, it is inevitable to obtain incorrect object boundaries. The proposed method, on the other hand, achieves the detection of objects by utilizing not only the motion vectors, but also the color information and the previous segmentation result. Another difference of the described method compared to those prior methods is the ability to achieve the detection and the tracking of objects simultaneously.

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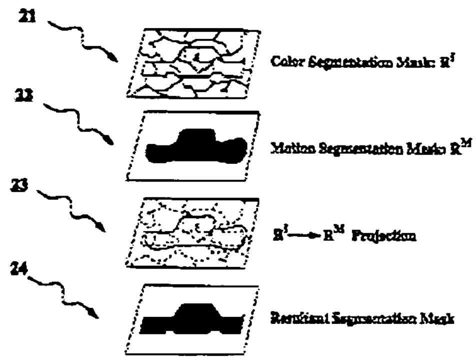

Figure 3.

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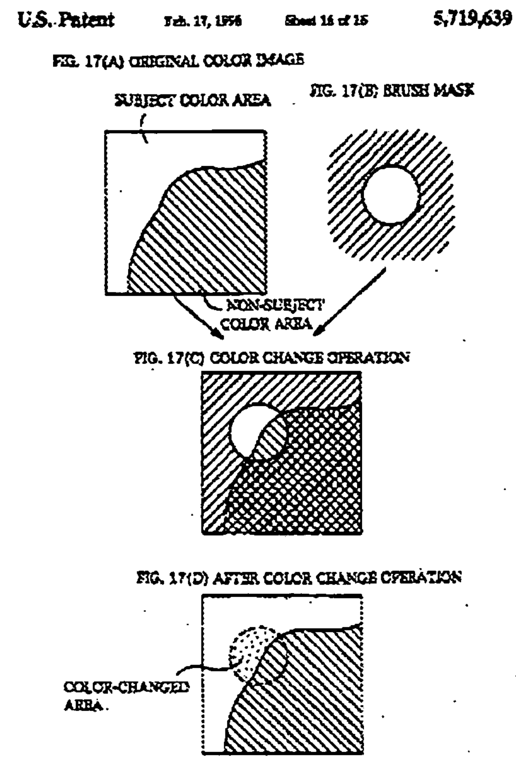
Brief Summary Text - BSTX (9):

The present invention is directed to a method of changing a color in a color image into another color. The method comprises the steps of: (a) specifying first and second colors for defining a color range to be processed by color change operation; (b) specifying a substitute color, which is to be used as a color component of a changed color after the color change operation; (c) obtaining first and second color vectors representing the first and second colors in a color space; (d) obtaining a substitute color vector representing the substitute color in the color space; (e) obtaining a third color vector linearly independent of the first and second color vectors; (f) expressing a color of each pixel in the color image by a linear combination of the first through third color vectors, to thereby obtain first through third coefficients for the first through third color vectors; and (g)



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EAST Browser - L70: (7) color mea... | US 6439722 B1 | ... | Doc: 3?7 | Format: KWIC

File Edit View Tools Window Help

request for a color image to facilitate the color characterization of a self-illuminating imaging device associated with the browser, forward the embedded response to a web browser, and generate a profile characterizing the self-illuminating imaging device using the color characterization program. The system is further configured to modify a response to a subsequent browser based request for a color image by replacing the image tags associated with the color image with substitute image tags configured to effect a color transformation based upon the profile characterizing the self-illuminating imaging device, forward the modified response to the web browser, and transform the color image based upon the substitute image tags for display on the self-illuminating imaging device.

Brief Summary Text - BSTX (18):

The system is further configured to modify

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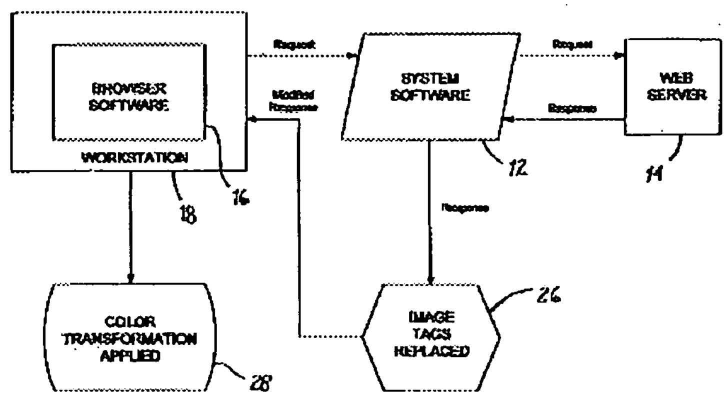

FIG. 2

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Color Blind

US-PAT-NO: 6307961

DOCUMENT-IDENTIFIER: US 6307961 B1

TITLE: User-interactive corrective tuning of color profiles

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Claims Text - CLTX (16):

editing said color profile by replacing existing color tag information with said modifications,

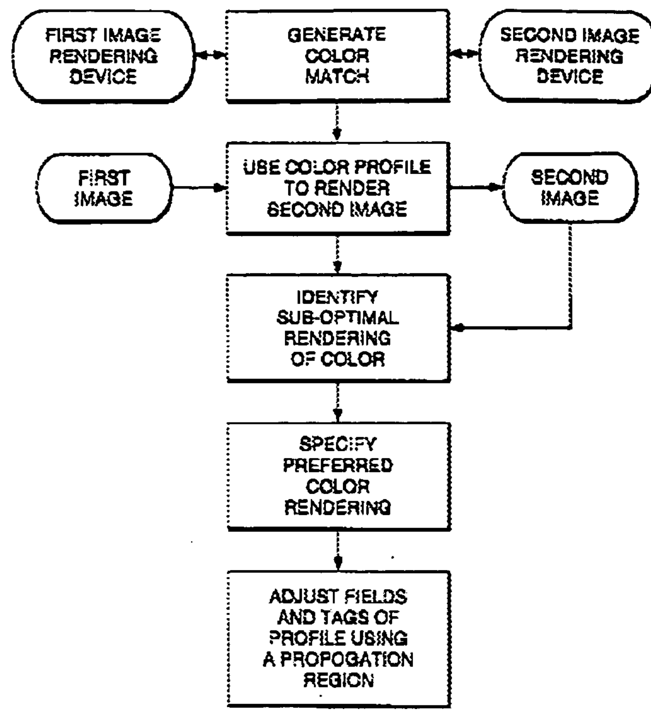
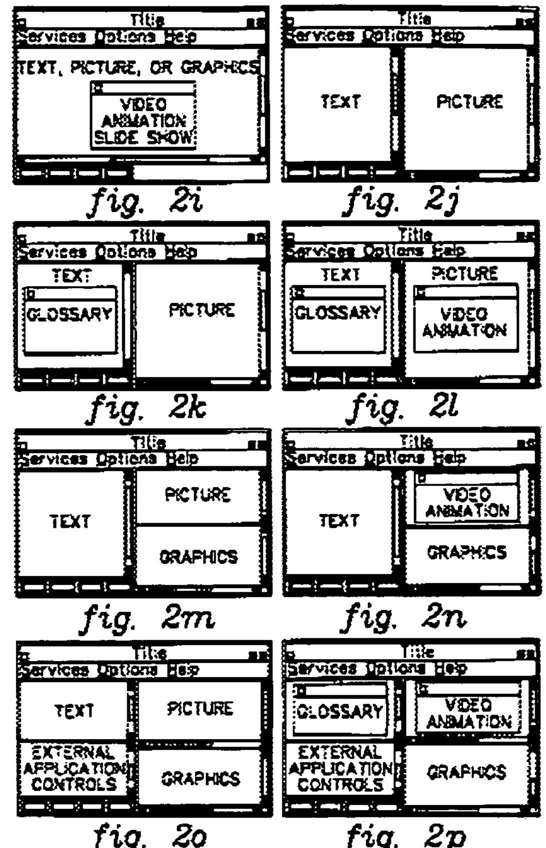


FIG. 2

Detailed Description Text - DETX (33):

In a similar regard to the foregoing discussion of adaptation to a user with a hearing impairment, a visual impairment may be accounted for as well. For example, a user who is color blind may be unable to easily see certain hypermedia objects and the contents thereof. Therefore, the system may change color schemes based upon an indication of color blindness in a user profile. The color scheme change may be performed by substituting distinguishable colors for indistinguishable ones, or, for example, converting displayed images to black and white.



a workstation associated with the self-illuminating imaging device, wherein the cookie represents a set of twelve numerical profiling values; and b) a synchronization stage including: i) means for modifying a response to a subsequent browser based request for a color image by replacing the image tags associated with the color image with substitute image tags configured to effect a color transformation based upon the profile characterizing the self-illuminating imaging device; ii) means for forwarding the modified response to the web browser; and iii) means for transforming the color image based upon the substitute image tags for display on the self-illuminating imaging device.

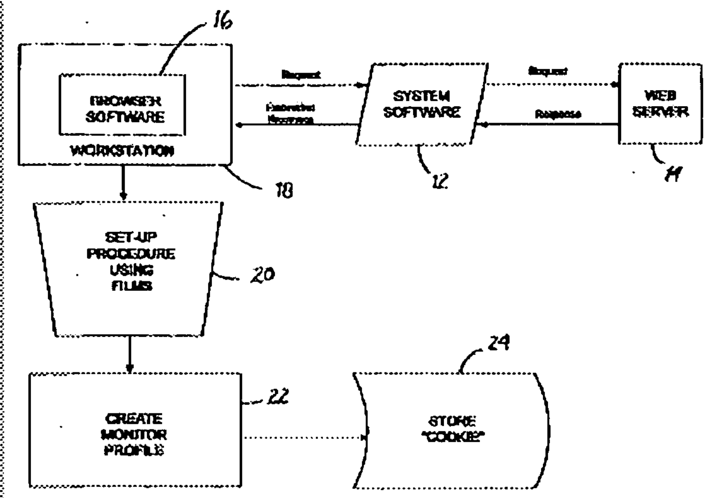


FIG. 1

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Detailed Description Text - DETX (173):

The clipping procedure in box 622 involves accessing the 19 by 40 fineGamut array containing the monitor gamut a*, b* values to find the maximum chroma for the modified color's L* value. If the maximum chroma is greater than the modified color's chroma, the modified color's chroma is replaced by the maximum chroma, and the cylindrical coordinates of the color are converted back to LAB color space a*, b* coordinates. The Cedar language code in Table 14 below illustrates this processing. Those skilled in the art will recognize that, while color editing GUI 10 takes advantage of the perceptual uniformity of CIELAB color space to perform color editing functions, another suitable clipping algorithm may be used to change the user's color modifications to place the modified color in the monitor's color gamut.

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U.S. Patent May 16, 1995 Sheet 1 of 34 5,416,890

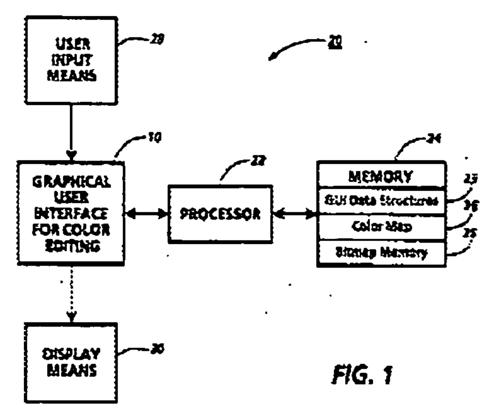

FIG. 1

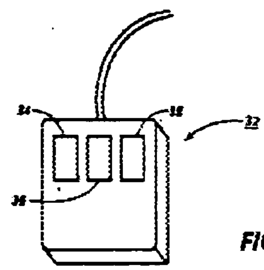

FIG. 2

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File Edit View Tools Window Help

Detailed Description Text - DETX (173):

The clipping procedure in box 622 involves accessing the 19 by 40 fineGamut array containing the monitor gamut a*, b* values to find the maximum chroma for the modified color's L* value. If the maximum chroma is greater than the modified color's chroma, the modified color's chroma is replaced by the maximum chroma, and the cylindrical coordinates of the color are converted back to LAB color space a*, b* coordinates. The Cedar language code in Table 14 below illustrates this processing. Those skilled in the art will recognize that, while color editing GUI 10 takes advantage of the perceptual uniformity of CIELAB color space to perform color editing functions, another suitable clipping algorithm may be used to change the user's color modifications to place the modified color in the monitor's color gamut.

Details Text Image HTML KWIC

U.S. Patent Sheet 2 of 34 5,416,890

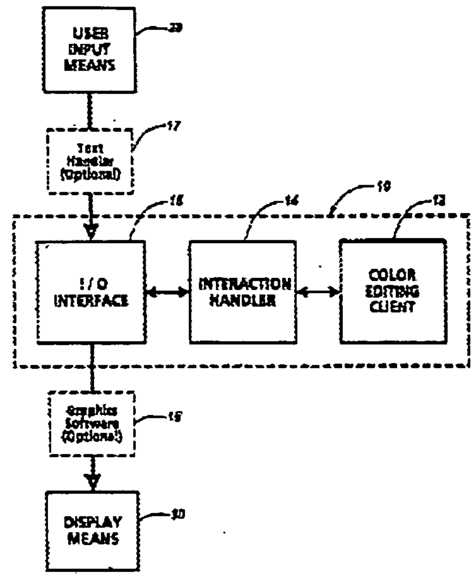

FIG. 3

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Detailed Description Text - DETX (173):

The clipping procedure in box 622 involves accessing the 19 by 40 fineGamut array containing the monitor gamut a*, b* values to find the maximum chroma for the modified color's L* value. If the maximum chroma is greater than the modified color's chroma, the modified color's chroma is replaced by the maximum chroma, and the cylindrical coordinates of the color are converted back to LAB color space a*, b* coordinates. The Cedar language code in Table 14 below illustrates this processing. Those skilled in the art will recognize that, while color editing GUI 10 takes advantage of the perceptual uniformity of CIELAB color space to perform color editing functions, another suitable clipping algorithm may be used to change the user's color modifications to place the modified color in the monitor's color gamut.

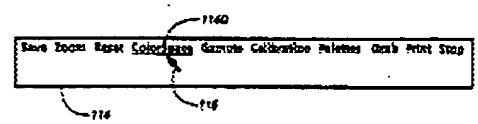
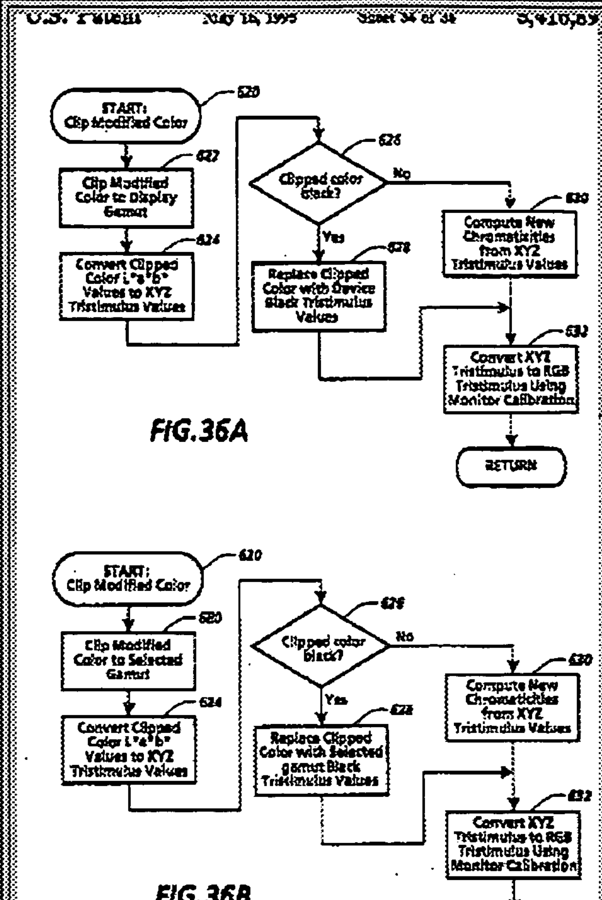


FIG. 5

Detailed Description Text - DETX (173):

The clipping procedure in box 622 involves accessing the 19 by 40 fineGamut array containing the monitor gamut a*, b* values to find the maximum chroma for the modified color's L* value. If the maximum chroma is greater than the modified color's chroma, the modified color's chroma is replaced by the maximum chroma, and the cylindrical coordinates of the color are converted back to LAB color space a*, b* coordinates. The Cedar language code in Table 14 below illustrates this processing. Those skilled in the art will recognize that, while color editing GUI 10 takes advantage of the perceptual uniformity of CIELAB color space to perform color editing functions, another suitable clipping algorithm may be used to change the user's color modifications to place the modified color in the monitor's color gamut.



US-PAT-NO: **6038340**

DOCUMENT-IDENTIFIER: US **6038340** A

TITLE: System and method for detecting the black and white points of a color image

---------- KWIC ---------

Abstract Text - ABTX (1):
A system for detecting image black and white points for a digital image. The system includes image partitioning routines for partitioning a digital image into image blocks, a pixel counter for determining whether the image block contains sufficient black and white pixels to classify the block as having relatively black text on a relatively white background, block validity testing routines for determining whether the selected image block is valid by determining whether the number of relatively black pixels for the selected image block is greater than a **predetermined** black threshold and whether the number of relatively white pixels for the selected image block is greater than a **predetermined** white threshold, and pixel clustering routines for arranging the relatively black pixels of a valid block into black clusters and the relatively white pixels of a valid block into white clusters and for assigning one of the black cluster centroids based on a first **predetermined** set of rules as the image black point and one of the white cluster centroids based on a second **predetermined** set of rules as the image white point.

US Patent No. - PN (1):
6038340

US Document Identifier - DID (1):
US **6038340** A

Brief Summary Text - BSTX (12):
The image partitioning routines partition a digital image into image blocks, and a pixel counter counts the relatively black pixels and the relatively white pixels in a selected image block to determine whether the image block contains a sufficient number of black and white pixels to classify the block as having

relatively black text on a relatively white background. The block validity testing routines determine whether the selected image block is valid by determining whether the number of relatively black pixels for the selected image block is greater than a **predetermined** black threshold and whether the number of relatively white pixels for the selected image block is greater than a **predetermined** white threshold. The pixel clustering routines arrange the relatively black pixels of a valid block into black clusters and the relatively white pixels of a valid block into white clusters, and assign a black cluster centroid as the image black point and a white cluster centroid as the image white point.

Brief Summary Text - BSTX (15):
The invention also provides a method for detecting image black and white points for a digital image. The method includes the steps of partitioning the digital image into image blocks, determining whether the block is valid by determining whether the number of relatively black pixels in the block is greater than a **predetermined** black threshold and whether the number of relatively white pixels in the block is greater than a **predetermined** white threshold, arranging the relatively black pixels into black clusters and the relatively white pixels into white clusters for each valid block and assigning the centroid of one of the black clusters and the centroid of one of the white clusters as the black and white points, respectively.

Detailed Description Text - DETX (20):
Pixel clustering routines 340 in step 530 test whether all the pixels have been tested. If so, then method 450 ends. If not, then in step 540 pixel clustering routines 340 select an untested pixel and in step 550 compares the selected pixel's RGB values with the centroids' RGB values of the "current" (i.e., as currently established) clusters. Pixel clustering routines 340 in step 560 determine whether the selected pixel resides within a **predetermined** "distance" (dR, dG, dB) of a cluster centroid to determine whether it belongs to that cluster. Step 560 may be implemented using absolute values, Euclidean distances, etc. If the pixel does not belong to any of the clusters, then in step 570 pixel clustering routines 340 set the RGB values of the selected pixel to be the centroid of a new cluster, and return to step 530.

Detailed Description Text - DETX (21):
If the selected pixel is within the **predetermined** distance of a cluster centroid, then in step 580 pixel clustering routines 340 assign the selected pixel to be a member of the cluster, increments by one the number of pixels in that cluster, and computes the new cluster centroid. Pixel clustering routines

340 in step 590 preferably apply the following centroid averaging equations:

Detailed Description Text - DETX (23):
FIG. 6 is a flowchart illustrating steps in the FIG. 4 operation 470, which begins in step 610 with pixel clustering routines 340 determining the black cluster having the most black pixels. Pixel clustering routines 340 preferably disregard as noise all black clusters having less than a **predetermined** minimum pixel count, such as 20,000 pixels. The minimum pixel count varies depending on the scan resolution. If multiple clusters are identified, then in step 620 pixel clustering routines 340 compare the clusters' centroid RGB values to select the darkest of the clusters as the black cluster. Pixel clustering routines 340 in step 630 round the centroid RGB values of the selected black cluster to the nearest integer, and assign this centroid value of the black cluster to be the black point. Method 470 then ends.

Detailed Description Text - DETX (24):
FIG. 7 is a flowchart illustrating steps in the FIG. 4 operation 480, which begins in step 710 with pixel clustering routines 340 determining the white cluster having the most white pixels. Pixel clustering routines 340 preferably disregard as noise all white clusters having less than a **predetermined** minimum pixel count, such as 50,000 pixels. This minimum pixel count also varies depending on the scan resolution. If multiple clusters are identified, then in step 720 pixel clustering routines 340 compare the clusters' centroid RGB values to select the lightest of the clusters as the white cluster. Pixel clustering routines 340 in step 730 round the centroid RGB values of the selected white cluster to the nearest integer, and assign this centroid value of the white cluster to be the white point. Method 480 then ends.

Detailed Description Text - DETX (25):
Where the total number of black/white pixels in all valid blocks is denoted by K, the number of clusters is denoted by M (initially 0), the RGB values for the k.sup.th pixel are denoted by (R.sub.k, G.sub.k, B.sub.k), the **predetermined** maximum RGB distance for a pixel to be a member of a particular
cluster is denoted by d.sub.R, d.sub.G and d.sub.B, the centroid of the m.sup.th cluster is denoted by (C.sub.m.sup.R, C.sub.m.sup.G, C.sub.m.sup.B) and the number of pixels in the m.sup.th cluster is denoted by N.sub.m, the pixel clustering algorithms may be written in "pseudo-code" as follows:

Detailed Description Paragraph Table - DETL (1):

C.sub.0 .sup.R = R.sub.0 ; C.sub.0 .sup.G = G.sub.0 ; C.sub.0 .sup.B = B.sub.0 ; ***first centroid is set to first black/white pixel*** M = 1; ***set number of current black/white clusters*** for (k = 1; k < K; k++)[***for each black/white pixel*** part-of-an-old-cluster = No; for (m = 0; m < M; m++) [***for each black/white cluster*** if .vertline.R.sub.k - C.sub.m .sup.R .vertline. < d.sub.R ***are pixel RGB values .vertline.G.sub.k - C.sub.m .sup.G .vertline. < d.sub.G within **predetermined** .vertline.B.sub.k - C.sub.m .sup.B .vertline. < d.sub.B distance of a cluster centroid*** then C.sub.m .sup.R = [(N.sub.m *C.sub.m .sup.R) + R.sub.k]/ ***compute new centroids*** (N.sub.m + 1); C.sub.m .sup.G = [(N.sub.m *C.sub.m .sup.G) + G.sub.k]/ (N.sub.m + 1); C.sub.m .sup.B = [(N.sub.m *C.sub.m .sup.B) + B.sub.k]/ (N.sub.m + 1); N.sub.m = N.sub.m + 1; part-of-an-old-cluster = Yes;] ***end if***] ***end for m*** if (part-of-an-old-cluster = No) [***new cluster*** then C.sub.M .sup.R = R.sub.k ; C.sub.M .sup.G = G.sub.k ; C.sub.M .sup.B = B.sub.k ; ***new cluster's centroid set N.sub.M = 1; M++; to pixel RGB values***] ***end if***] ***end for k*** max = min-number-of-pixels; ***minimum number of pixels for a cluster to be valid*** for (m = 0; m < M; m++) [***for each black/white cluster*** if (N.sub.m > max) [***no noise*** then P.sub.R = (C.sub.m .sup.R + .5); *** black/white point equals P.sub.G = (C.sub.m .sup.G + .5); centroid of black/white cluster P.sub.B = (C.sub.m .sup.B + .5); having most member pixels max = N.sub.m ; rounded off to nearest integer***]

Claims Text - CLTX (3):

classifying each of the image blocks as valid if a given image block has a total number of relatively black pixels exceeding a first **predetermined** threshold and a total number of relatively white pixels exceeding a second **predetermined** threshold, wherein a relatively black pixel is defined as a pixel whose color component values are each less than a **predetermined** black pixel threshold and a relatively white pixel is defined as a pixel whose color component values are each greater than a **predetermined** white pixel threshold;

Claims Text - CLTX (5):

selecting one of the black cluster centroids according to a first **predetermined** set of rules to be a black point of the digital image and one of the white cluster centroids according to a second **predetermined** set of rules to be a white point of the digital image.

Claims Text - CLTX (7):

3. The method of claim 1, wherein a relatively black pixel is defined as a pixel whose RGB values are each less than the **predetermined** black pixel threshold and a relatively white pixel is defined as a pixel whose RGB values are each greater than the **predetermined** white pixel threshold.

Claims Text - CLTX (14):
determining whether each of the image blocks is valid, by determining whether a total number of relatively black pixels in a given image block is greater than a first **predetermined** threshold and whether a total number of relatively white pixels in the given image block is greater than a second **predetermined** threshold, wherein a relatively black pixel is defined as a pixel whose color component values are each less than a **predetermined** black pixel threshold and a relatively white pixel is defined as a pixel whose color component values are each greater than a **predetermined** white pixel threshold;

Claims Text - CLTX (16):
selecting one of the black cluster centroids based on a first **predetermined** set of rules as the black point and one of the white cluster centroids based on a second **predetermined** set of rules as the white point of the digital image.

Claims Text - CLTX (18):
9. The method of claim 7, wherein a relatively black pixel is defined as a pixel whose RGB values are each less than the **predetermined** black pixel threshold and a relatively white pixel is defined as a pixel whose RGB values are each greater than the **predetermined** white pixel threshold.

Claims Text - CLTX (25):
means for determining whether each of the image blocks is valid, by determining whether a total number of relatively black pixels in a given image block is greater than a first **predetermined** threshold and whether a total number of relatively white pixels in the given image block is greater than a second **predetermined** threshold, wherein a relatively black pixel is defined as a pixel whose color component values are each less than a **predetermined** black
pixel threshold and a relatively white pixel is defined as a pixel whose color component values are each greater than a **predetermined** white pixel threshold;

and

US-PAT-NO: 5537491

DOCUMENT-IDENTIFIER: US 5537491 A

TITLE: Analyzing an image or other data to obtain a stable number of groups

---------- KWIC ---------

Abstract Text - ABTX (1):
To **group** items in an array, gap data are obtained indicating gaps between items. The gap data are used to obtain threshold data, which are then used to obtain **grouping** data. The gaps could, for example, be distances between items
in a two-dimensional array or differences between values at which items occur in a one-dimensional array. The threshold data indicate a threshold. The threshold would produce a number of **groups** of the items that is stable across a range of thresholds, and the range of thresholds meets a criterion for largeness of a range. The criterion can require, for example, that the range be larger than the stable range of thresholds of any other number in a set of numbers of **groups**. The threshold can be obtained iteratively by applying a candidate threshold for each iteration. The candidate thresholds can be incremented, and the iterations can be counted to find a number of **groups** meeting the criterion. Or the candidate thresholds can be increased by differences between gaps, and a running sum of threshold ranges can be used to
find a number of **groups** meeting the criterion. The threshold can also be obtained directly by finding the largest difference between gap extents and obtaining a threshold within the largest difference. Many types of **grouping** can be performed, including spatial **clustering, segmentation** of partially bounded regions, **segmentation** by local width, and global and local similarity **grouping**.

Brief Summary Text - BSTX (18):
To **group** parts of an image, as in **clustering or segmentation,** the technique can obtain the gap data from data defining the image. For example, the gap data can indicate, for each pixel, a distance to a black pixel that is a near neighbor of the pixel. The threshold can be compared with each pixel's distance to obtain a thresholded version of the image; each pixel with a

distance above the threshold can be ON, or, alternatively, each pixel with a distance below the threshold can be ON. The technique can obtain the **grouping**
data by labeling each pixel in a part of the image with a unique identifier of the **group** in the thresholded version that includes the part.

Detailed Description Text - DETX (25):
An "**image" is a pattern** of physical light. An "**image** set" is a set of one or more **images**.

Detailed Description Text - DETX (26):
When an **image is a pattern** of physical light in the visible portion of the electromagnetic spectrum, the **image** can produce human perceptions. The term
"graphical feature", or "feature", refers to any human perception produced by, or that could be produced by, an **image**.

Detailed Description Text - DETX (62):
A "threshold" is a **function** that can be used to distinguish a number of items into two sets, one set "above" the threshold, and the other set "below" the threshold. A threshold can be a **function of position** or context within an array of items, or can have the same value for every **position** and context in the array. The value of a threshold that has the same value for every **position** and context is typically indicated by indicating either the lowest of the values above the threshold or the highest of the values below the threshold.

Detailed Description Text - DETX (63):
A "gap" between items in an array is a portion of the array that extends between the items and does not include any other items that meet an appropriate
criterion. For example, in an array of binary items such as a binary image, a gap could extend between two ON items that are separated by OFF items or between two OFF items that are separated by ON items. More generally, in an array of n-ary items, a gap could extend between items above a threshold that are separated by items below the threshold or vice versa. In principle, an array within which gaps occur is equivalent to a variety of data structures--for each item, a value could be indicated; items with each value could be listed; in a binary array, items with one value could be listed, implicitly indicating that all other items have the other value; a hash table or other data structure could indicate each item's value when accessed with the

item's **position** in the array; or a mathematical **function of position** could provide each item's value. In practice, however, it is advantageous to define an array in a manner that facilitates computation to obtain data indicating information about a gap between items.

Detailed Description Text - DETX (72):

An item of data "defines" a number of **groups** of items in an array if the item of data includes information indicating the number of **groups and, for each group,** the items it includes. For example, if a first array includes an item for each item in a second array, the first array can define a number of **groups** of items in the second array in several ways: Each item in the first array can be ON if a distance for its item in the first array is above a threshold or, alternatively below a threshold; in this case, the first array defines **groups** of adjacent items, which can be counted to obtain the number of **groups**. Or an item in the first array can include a **group** identifier identifying a **group** that includes its item in the second array; in this case, the first array defines **groups** of items that have the same **group** identifier and the **group** identifiers can be counted to obtain the number of **groups**. If the second array defines an image, the first array can define a version of the image in which the **groups cluster** connected components or **segment** the image.

Detailed Description Text - DETX (169):

The techniques described above can be used to perform several different types of **grouping,** including **clustering, segmentation** of images, and similarity **grouping**. FIGS. 12-15 illustrate several types of **grouping** that have been implemented using techniques described above. FIGS. 12-14 illustrate proximity **grouping** of three types--spatial **clustering, segmentation** of partially bounded regions, and **segmentation** by local width. FIG. 15 illustrates global similarity **grouping**.

Detailed Description Text - DETX (198):

Gap data can be obtained by performing project operations on the array to obtain a filled array, shifting the filled array, and taking a difference between the filled array and the shifted filled array, as described above, to obtain a list of differences or to obtain another array indicating, for each difference, whether it occurs. The gap data can be used to obtain a threshold as described above, by finding the largest difference between gap extents. The threshold can then be compared with the differences between non-zero values in the array to obtain grouping data indicating equivalence classes of the values of area. Each equivalence class can be given a unique identifier, and grouped **image** 432 can be obtained in which each pixel with a non-zero value in the area

data **image** is labeled with the unique identifier of the equivalence class that includes the value. The difference identifiers are represented in grouped **image** 432 by different **patterns** of grey.

Detailed Description Text - DETX (202):

The implementations described above apply a single-valued threshold to a **distance** for each item in an array. The implementations might be modified to apply a threshold that is a **function** that can assume different values at different positions in an array, such as a **function of position** or of context. For example, a threshold at a given **position could be a function** of a near neighbor's **distance** to its near neighbor or of any other value with which the **position** can be labeled.

Detailed Description Text - DETX (207):

The implementations described above operate on binary **images,** but could be extended to operate on color or gray scale **images,** either directly or after **binarization**.

~~**groups** of related objects as a function~~

of the **proximity** of the objects **to each other and as a function of the boundary data; and**

Beg 3 **means for supplying data relating to the groups** of **objects for subsequent analysis.**

9. A method for processing images

for producing clusters of related objects within an image **for subsequent analysis** , said method includinq **the steps of;**

supplying a multi-level digital representation of an image; identifying predetermined objects in the image; and supplying data defining the locations of the predetermined objects based on the multi-level digital representation of the image; **deriving boundary data from the multi-level digital representation** of the image, **the boundary data representing boundaries between regions of the original image** having different characteristics; and **clustering the predetermined objects into groups of** related objects as a function of the **proximity** of the objects **to each other and** a function of **the boundary data.**

17. **The image processing system of Claim 1, wherein said means for deriving boundary data derives boundary data based on a representation**